MISSOURI DEPARTMENT OF NATURAL RESOURCES

CLEANUP LEVELS FOR MISSOURI (CALM)

Tier 1 Soil and Groundwater Cleanup Standards September 1, 2001 Update, Background Document

Division of Environmental Quality
Hazardous Waste Program

Revised July 26, 2001

Background Document for
CALM Tier 1 Soil and Groundwater Cleanup Standards
2001 Update
Missouri Department of Natural Resources

The Missouri Department of Natural Resources' Voluntary Cleanup Program (VCP) has issued an update of the Tier 1 soil and groundwater target concentrations (STARC and GTARC) for the Cleanup Levels for Missouri (CALM) Guidance Document.

The new tables replace the 1998 lookup tables A3 (Toxicological Values), A4 (Chemical Property Values) and B1 (Soil and Groundwater Target Concentrations) in the CALM document. The 1998 tables will no longer be used after September 1, 2001.

How to Obtain Updated Tables

Find the DNR web site at www.dnr.state.mo.us, and navigate to Land Programs, Hazardous Waste Program, Voluntary Cleanup Section. You will be able to download PDF files of the updated tables for replacement in your CALM binder.

You can also obtain hard copies of the tables by contacting the Technical Assistance Program at (800) 361-4827.

STARC: Soil Cleanup Target Concentrations

The new tables were compiled by the Missouri Department of Health (DOH) using the Tier 1 risk assessment methods outlined in CALM (1998). DOH updated the values for physical/chemical and toxicological parameters for each contaminant and recalculated the Tier 1 Soil Target Concentrations (STARC). The databases that toxicity and physical-chemical parameters are drawn from – including EPA's Integrated Risk Information System (IRIS) and the Health Effects Assessment Summary Tables (HEAST) databases – are updated regularly with new data obtained from the scientific literature.

For the 2001 update, DOH established a hierarchy of sources for physical and toxicological parameters (see Table 1). This information was not provided for the 1998 tables and is being made available for 2001 to increase understanding of the process for determining CALM Tier 1 cleanup levels. Although we are not publishing the source notation for each individual value – there are several thousand values - the source for every value has been documented and is available if questions arise regarding a particular contaminant.

GTARC: Groundwater Target Concentrations

The Tier 1 Groundwater Target Concentrations (GTARC) were also updated. Overall, there were fewer changes in GTARC values than STARC values due to the reliance on Missouri Water Quality Standards and EPA MCLs which change relatively infrequently. For the 2001 update, DOH established a hierarchy of sources for GTARC values. This information was not provided for the 1998 tables and is being made available for 2001 to increase user understanding of the process for determining CALM Tier 1 cleanup levels. The GTARC hierarchy is shown in Table 2. Although we are not publishing the source notation for each individual value, the source for each value has been documented and is available if questions arise regarding a particular contaminant.

Comparison of '98 and '01 Standards

Refer to Table 3 for a table of the contaminants most often encountered at VCP sites with their respective 1998 and 2001 STARC and GTARC values for comparison.

Some Tier 1 values increased and some values decreased, depending on changes in toxicological and physical parameters. Use of the hierarchies in Tables 1 and 2 also resulted in the selection of some values from different sources than those used in 1998. Some Tier 1 STARCs have changed on this basis alone.

Implementation

Changing cleanup levels can potentially introduce uncertainty into the cleanup process. This must be balanced with the importance of using the most up to date science available. The tables are being published in advance of their effective date to assist users in the planning process for their sites.

New Sites: All new sites signing Letters of Agreement after Sept. 1, 2001 will be required to use the new levels for Tier 1 cleanups.

Sites already in the VCP:

> Approved Remedial Action Plan as of Sept. 1, 2001: the new cleanup standards will not be imposed.
>
> Without an approved Remedial Action Plan as of Sept. 1, 2001: Site will be subject to the new standards.

Deviations may be made from this implementation policy in specific cases at the department's discretion.

Notes on Certain Contaminants

Standards for several common contaminants underwent significant changes. These are explained below. Questions about these or other contaminants can be directed to the VCP.

Chromium

At this time there are not sufficient toxicological parameters acceptable to MDOH for calculating direct exposure (C_{idi}) values for Cr+3. The Tier 1 values are based on Cr+6 non-cancer toxicity and assuming that the ratio of Cr+3 to Cr+6 is 6:1. As in CALM '98, speciation can be performed on site samples under Tier 2 to verify the Cr+6:Cr+3 ratio; site-specific cleanup standards can be set on that basis. If Cr+3 values become available they will be applied on a site-specific basis until the next Tier 1 update. As a result of these changes, the individual values for Cr+3 and Cr+6 included in the Tier 2 discussion in CALM '98 Appendix C are no longer current. That entry will be revised with the next general CALM revision.

Lead Paint Dust Clearance Sampling Standards for Residential Use

Lead dust clearance standards for interior renovations are listed in CALM Appendix B, Section 7.2. The Environmental Protection Agency (EPA) has released a new value for clearance sampling for lead dust on floors in residential structures of 40 micrograms per square foot. This replaces the old value of 50 micrograms per square foot. All other lead abatement clearance standards listed remain the same. Section B7.7 will be revised with the next general CALM revision.

The department is in the process of publishing a Technical Bulletin on requirements for lead and asbestos abatement projects conducted under the Voluntary Cleanup Program. Watch our web page at http://www.dnr.state.mo.us/deq/hwp/hwpvcp.htm in the coming weeks for an announcement.

MTBE

The method used in 1998 to calculate C_{idi} is no longer preferred by MDOH. At present MTBE has a status of "No Tox Data." The C_{idi} values have therefore defaulted to the soil saturation concentration, C_{sat} of 8760 mg/kg. However, the C_{leach} value (0.067 mg/kg) will drive most cleanups due to the high solubility and low groundwater target concentration for MTBE.

Polynuclear Aromatic Hydrocarbons (PAH)

A group of PAH compounds have a common – and very low - Missouri Water Quality Standard (MOWQS) for groundwater of 10e-6 mg/L. These include:

benzo (a) anthracene, benzo (k) fluoranthene, chrysene, dibenzo (a,h) anthracene, and indeno (1,2,3-cd) pyrene. CALM GTARCs have been set to match the MOWQS. In addition, a number of other PAH compounds that had no MOWQS were given the same GTARC.

Practical detection limits for some of these compounds are higher than the MOWQS/GTARC values using standard laboratory analysis such as EPA Method 8270 or even the more sensitive Method 8310. Adjustments can be made on a site-specific basis to take into account the limits of analytical technology.

Table 1
Hierarchy of Sources for Chemical Property and Toxicological Values
For CALM 2000 STARC

Toxicological Parameters

1. Integrated Risk Information System (IRIS), EPA, March 2000 Update
2. Health Effects Assessment Summary Tables (HEAST), EPA, FY 1997 Update
3. Superfund Technical Support Center Memorandum
4. Soil Screening Guidance, EPA, 1996
5. Dermal Risk Assessment Guidance, EPA, 1998

Physical Parameters

1. Handbook of Physical Properties of Organic Chemicals, Howard and Meylan, 1997
2. Dangerous Properties of Industrial Materials, 7th Ed., Sax and Lewis, 1989
3. Extoxnet web site, http://ace.ace.orst.edu/info/extoxnet/pips, January, 2000
4. EPA Air Toxics web site, http://www.epa.gove/ttn/uatw/hlthef or CHEMFATE database, January, 2000
5. EPA Region 9 Preliminary Removal Goals, January, 2000

Table 2
Hierarchy of Sources for Groundwater Standards
CALM 2000 GTARC

1. EPA Maximum Contaminant Level (MCL)
2. EPA Health Advisory Level (EPA HAL)
3. 10e-6 Cancer Risk Level (derived from EPA oral slope factors)
4. Missouri Water Quality Standards for Groundwater
5. Missouri Water Quality Health Advisory Levels (MO HAL)

Table 3: Comparison of 1998 and 2001 CALM Tier 1 Cleanup Levels
For Common Contaminants

Chemical	Scenario A mg/kg		Scenario B mg/kg		Scenario C mg/kg		C_{leach} mg/kg		GTARC mg/L	
	1998	2001	1998	2001	1998	2001	1998	2001	1998	2001
Lead	260	260	660	660	660	660	NA	NA	0.015	0.015
Arsenic	11	11	11	11	14	14	NA	NA	0.05	0.050
cis-1,2-dichloroethene	280	1200	400	1200	910	1200	0.51	0.5	0.07	0.07
Trichloroethylene	37	40	52	56	81	89	0.097	0.1	0.005	0.005
Tetrachloroethylene	49	40	69	55	160	120	0.42	0.1	0.005	0.005
Benzene	7.6	6	11	8	16	13	0.057	0.05	0.005	0.005
Toluene	890	650	890	650	890	650	5.13	3.7	0.15	0.15
Ethylenzene	1460	400	1460	400	1460	400	55	32	0.32	0.7
Xylene	1510	418	1510	418	1510	418	55	16	0.32	0.32
MTBE	170	8760	240	8760	550	8760	3.77	0.067	0.04	0.02
TPH	200	200	500	500	1000	1000	NA	NA	10	10
Anthracene	21000	8500	29500	12000	69000	27000	16700	33000	10	9.6
Benzo(a)Anthracene	1.1	1	1.5	2	4.2	4	4.7	0.2	0.0001	4.4e-6
Benzo(a)Pyrene	0.16	0.2	0.23	0.2	0.63	0.6	130	24	0.0002	0.0002
Benzo(b)Fluoranthene	0.94	0.9	1.4	1	3.7	4	15	0.6	0.0001	4.4e-6
Benzo(k)Fluoranthene	8	8	11.5	12	32	32	150	0.6	0.001	4.4e-6
Chrysene	36	36	52	52	143	140	470	2100	0.01	4.4e-6
Dibenzo(a,h)anthracene	0.15	0.2	0.21	0.2	0.57	0.6	4.5	2	1e-5	4.4e-6
Fluoranthene	600	1600	830	2300	1900	5200	4480	3800	1	0.3
Fluorene	2800	1100	3900	1600	9300	3600	940	2100	1	1.3
Indeno-1,2,3(cd)Pyrene	2.9	3	4.2	4	11	11	41	1.8	0.0001	4.4e-6
Naphthalene	970	120	1350	170	3100	240	5.3	24	0.02	0.1
Pentachlorophenol	5.7	6	7.9	9	22	25	7.4	0.07	0.001	0.001
PCBs	0.6	0.6	0.9	0.9	2.5	2.5	NA	18	0.0005	0.0004

Notes:

1. Values that increased in 2001 shown in green; values that decreased shown in red.
2. Changes in many Cleach values for 2001 are a result of the use of a new hierarchy of sources for determination of physical/chemical properties such as Kd, solubility etc.
3. When IDI values do not change across A, B and C land use scenarios, the value represents a calculated saturation concentration (Csat) which was found to be lower than the health-based values. Csat is substituted for Cidi when it is lower to prevent free liquid product conditions being declared clean.

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